Practice paper - 3

Topic: Bipolar Junction Transistors (1)

1. A BJT has an Early voltage of 80 V. The collector current is I_C = 0.60 mA at a collector–emitter voltage of V_{CE} = 2 V. (a) Determine the collector current at V_{CE} = 5 V. (b) What is the output resistance?

2. In the following circuit (Fig. 1), find the I_B, V_E and V_C. Assume, β = 100 and $|V_{BE}|$ = 0.7 V.

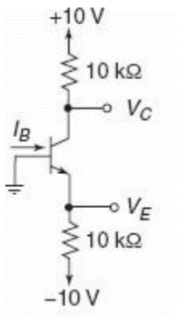


Fig. 1

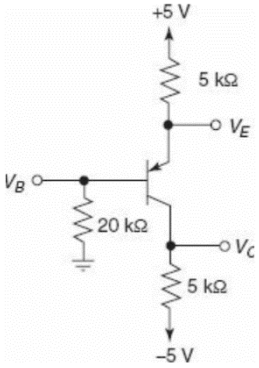


Fig. 2

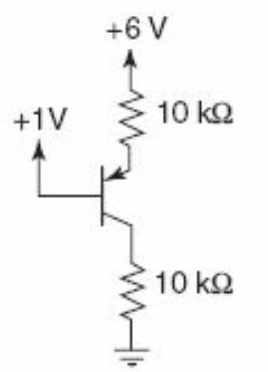


Fig. 3

3. The circuit shown in Fig. 2 has V_E = 1 V. Find V_B, V_C, I_C, I_B, α and β. Assume, $|V_{BE}|$ = 0.7 V.

4. Identify, whether the p-n-p transistor (shown in Fig. 3) is in active mode or in saturation mode. Assume, β = 100 and $|V_{BE}|$ = 0.7 V.

5. In the circuit shown in Fig. 4, find V_C. Assume, β = 75 and $|V_{BE}|$ = 0.7 V.

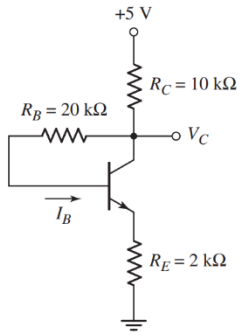


Fig. 4

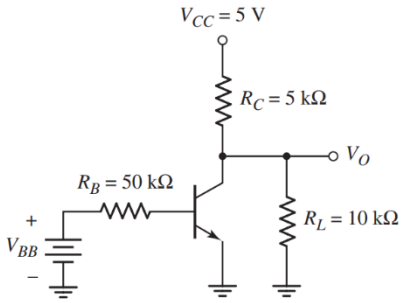


Fig. 5

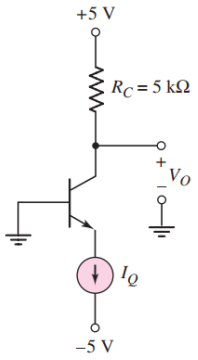


Fig. 6

6. (a) The common emitter current gain of the transistor in Fig. 5 is β = 75. Determine V_0 for: (i) V_{BB} = 0, (ii) V_{BB} = 1 V, and (iii) V_{BB} = 2 V.

7. The transistor shown in Fig. 6 has β = 100. Determine V_O for (i) I_Q = 0.1 mA, (ii) I_Q = 0.5 mA, and (iii) I_Q = 2 mA.

8. In the common-base (CB) circuit shown in Fig. 7, assume the transistor gain $\alpha = 0.9920$. Determine I_E, I_C, and V_{BC}.

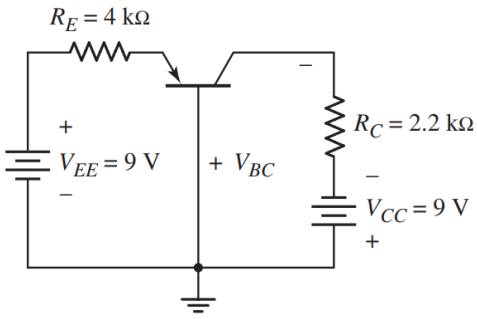


Fig. 7

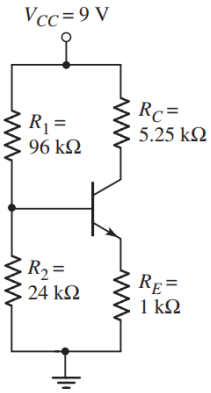
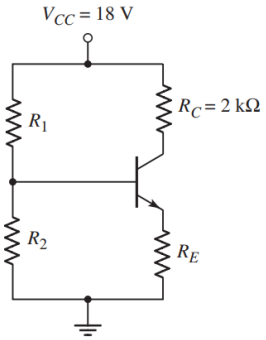


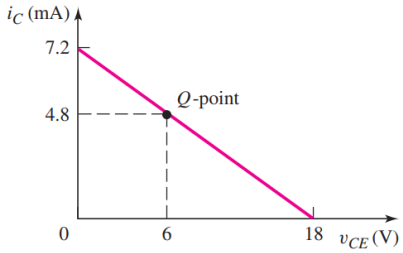
Fig. 8

9. Consider the circuit shown in Fig. 8. (a) Determine I_{BQ}, I_{CQ}, and V_{CEQ} for $\beta = 80$. (b) What is the percent change in I_{CQ} and V_{CEQ} if β is changed to $\beta = 120$? Now, comment on the change in I_{CQ} and V_{CEQ} compared to the change in β.

10. The dc load line and Q-point of the circuit in Fig. 9(a) are shown in Fig. 9(b). For the transistor, $\beta = 120$. Find R_E, R_1, and R_2 such that the circuit is bias stable in terms of change in β.



(a)



(b)

Fig. 9